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NONWOVEN FABRIC

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[There are no amendments to this patent.]

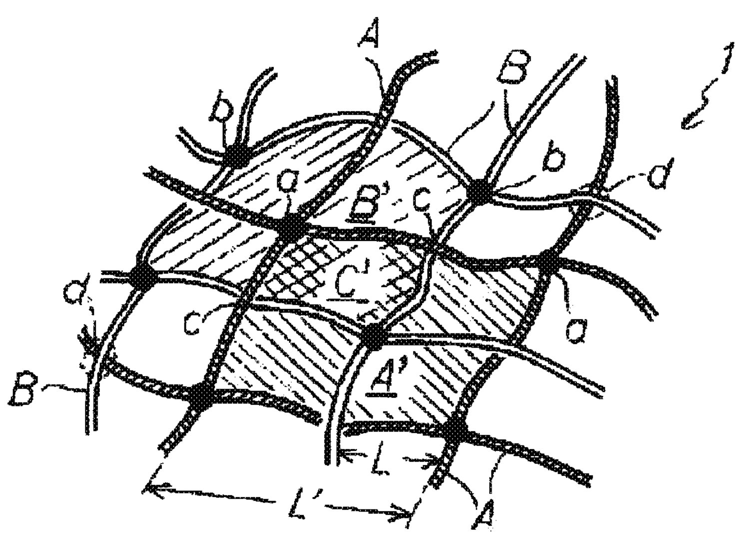
Abstract

Problems

To produce a nonwoven fabric having an excellent feel to the touch and excellent peel strength, when the male component of the mechanical fastener is applied while suppressing formation of scuffing, and accommodates repeated application of the aforementioned male component and is useful as a material for the female component of a mechanical fastener at high productivity.

Means to solve

A nonwoven fabric 1 characterized in that it comprises a mixture of at least two kinds of thermally fusible fibers A and B that are not likely to undergo mutual fusion, and fibers of the same kind are firmly fused at mutual intersections a and b and the aforementioned intersections a and b are provided over the entire area.



Claims

1. A nonwoven fabric characterized by comprising a mixture of at least two kinds of thermally fusible fibers that are not likely to undergo mutual fusion, and fibers of the same kind are firmly fused at the mutual intersections and the aforementioned intersections and are provided over the entire area.

2. The nonwoven fabric described in Claim 1, characterized by the fact that the aforementioned two kinds of thermally fusible fibers that are not likely to undergo mutual fusion are selected from among the group of fibers having a core-sheath structure in which the sheath component is made of a polypropylene with a low melting point, a fiber having a core-sheath structure in which the sheath component is made of a polyethylene and a fiber having a core-sheath structure in which the sheath component is made of a polyester with a low melting point.

3. The nonwoven fabric described in Claim 1, characterized by the fact that the aforementioned nonwoven fabric is provided with many non-fused intersections where dissimilar fibers overlap one another and cross without fusion of the fibers to each other and/or lightly fused intersections where fibers are weakly fused, and furthermore, the resulting mesh that includes the aforementioned intersections and non-fused intersections and/or lightly fused intersections is free to undergo deformation and expansion.

4. The nonwoven fabric described in one of Claims 1-3, characterized by the fact that the aforementioned nonwoven fabric is the female component of a mechanical fastener.

Detailed explanation of the invention

[0001]

Technical field of the invention

The present invention pertains to a nonwoven fabric having an excellent feel to the touch and for which high productivity can be achieved and which is useful as a material for the female component of mechanical fasteners.

[0002]

Prior art and problems to be solved by the invention

Many mechanical fasteners used as fastening tapes of absorbing products such as disposable diapers are being proposed and used in recent years. In the aforementioned mechanical fasteners, components commonly referred to as a male component and female component are brought into contact with each other and applied in a releasable manner, and in general, a sheet used for the female component provided with loops 103 for hooking and engagement member of the male component 10 formed by partially bonding a laminate

consisting of a fiber knit material 101 and a film sheet 102 such as the one shown in Figure 9 is used as the female component. However, the aforementioned sheet used for the female component is a knitted material; thus, shape retention is poor and furthermore, problems such as neck-in are likely to occur during the production process. Furthermore, use of a sheet provided with needle punching to form the female component is proposed in Japanese Kokai Patent Application No. Hei 7[1995]-313213, but the productivity achievable with the aforementioned sheet is low, and furthermore, production cost is high.

[0003]

Based on the above background, use of a nonwoven fabric having good feel to the touch as the female component is proposed; however, as shown in Figure 10, separation of the fused area 112 of the fibers 111 takes place due to the force applied by the engagement member 10 and sufficient peel strength to be used as a female component is absent, and furthermore, when the male component, once applied, is removed, scuffing occurs and repeated use is not possible and many problems exist. Furthermore, an increase in the fiber density has been proposed in an effort to increase the peel strength, but in this case as shown in Figure 11, the freeness of the individual fibers 121 is reduced and hooking of the aforementioned engagement member is not likely to be achieved and as a result, the peel strength is reduced.

[0004]

Based on the above background, the purpose of the present invention is to provide a nonwoven fabric having excellent feel to the touch and providing excellent peel strength when the male component of the mechanical fastener is applied while suppressing formation of scuffing and accommodating the repeated use of the aforementioned male component, and is useful as a material for the female component of a mechanical fastener that can be produced with high productivity.

[0005]

Means to solve the problem

As a result of much research conducted by the inventors of the present application in an effort to eliminate the aforementioned existing problems, it was discovered that the aforementioned purpose could be achieved by a nonwoven fabric having at least two kinds of fiber that are not likely to undergo mutual fusion.

[0006]

The present invention is based on the above knowledge and the purpose is to produce a nonwoven fabric characterized by comprising a mixture of at least two kinds of thermally fusible fibers that are not likely to undergo mutual fusion, and fibers of the same kind are firmly fused at the mutual intersections and the aforementioned intersections and are provided over the entire area.

[0007]

Furthermore, the present invention aims to produce the aforementioned nonwoven fabric from two kinds of fibers that are difficult to thermally fuse with each other selected from the group of fibers having a core-sheath structure in which the sheath component is made of a polypropylene with a low melting point, a fiber having a core-sheath structure in which the sheath component is made of polyethylene and a fiber having a core-sheath structure in which the sheath component is made of a polyester with a low melting point. Furthermore, the present invention aims to produce the nonwoven fabric described in Claim 1 characterized by the fact that the aforementioned nonwoven fabric is provided with many non-fused intersections where dissimilar fibers are overlaid and cross without fusion of the individual fibers and/or with only lightly fused intersections where individual fibers are weakly fused, and furthermore, the resulting mesh that includes the aforementioned intersections and non-fused intersections and/or lightly fused intersections is free to undergo deformation and expansion. Finally, the present invention aims to produce the aforementioned nonwoven fabric to be used as the female component of a mechanical fastener.

[0008]

Embodiment of the invention

The nonwoven fabric of the present invention is explained in further detail below. The nonwoven fabric of the present invention is made of a mixture of at least two kinds of thermally fusible fibers that are not likely to undergo mutual fusion. In this case, the aforementioned terminology, "not likely to undergo mutual fusion," means absence of fusion or fusion does take place but the degree of fusion is lower than the case in which the same kinds of thermally fusible components are fused, even under conditions in which fusion takes place when the same kinds of thermally fusible components are used.

[0009]

For the aforementioned two kinds of thermally fusible fibers that are not likely to form mutual fusion used in the nonwoven fabric of the present invention, it is not especially limited as

long as mutual fusion is not likely to occur, and in the case of the present invention, fibers selected among the group of fibers consisting of fibers having a core-sheath structure in which the sheath component is made of polypropylene with a low melting point, a fiber having a core-sheath structure in which the sheath component is made of polyethylene and a fiber having a core-sheath structure in which the sheath component is made of a polyester with a low melting point can be used effectively.

[0010]

In other words, for example, when a fiber having a core-sheath structure in which a polypropylene with a low melting point is used as the sheath component for one of the aforementioned two fibers (hereinafter referred to as "fiber A"), it is desirable when either a fiber having a core-sheath structure in which a polyethylene is used as the sheath component or a fiber having a core-sheath structure in which a polyester with a low melting point is used as the sheath component serves as the other fiber (hereinafter referred to as "fiber B") of the aforementioned two kinds of fibers. Furthermore, it is further desirable when a fiber having a core-sheath structure in which a polypropylene with a low melting point is used as the sheath component is used as the fiber A to provide a sealing property and strength to the nonwoven fabric obtained, and a fiber having a core-sheath structure in which a polyethylene is used as the sheath component is used as fiber B so as to provide a good feel to the touch and strength to the nonwoven fabric obtained.

[0011]

For the aforementioned polypropylene with a low melting point used as the sheath component of the fiber having a core-sheath structure in which the aforementioned polypropylene with a low melting point is used as a sheath component, known polypropylenes with a low melting point can be used effectively without any restriction, and in this case, it is desirable when the material is selected from among those having melting points in the range of 130-150°C. Furthermore, for the core component, polyethylene terephthalate (melting point 250-270°C), polypropylene (melting point 150-170°C), etc., can be mentioned. As for the ratio of the aforementioned sheath component and the core component, 30-70 parts by weight of the aforementioned sheath component and 70-30 parts by weight of the aforementioned core component is desirable, and in order to achieve high fusion strength, use of 50-70 parts by weight of the aforementioned sheath component and 50-30 parts by weight of the aforementioned core component is desirable. For the fiber having a core-sheath structure with the sheath component made of the aforementioned polypropylene with a low melting point, commercial products, for example, SP fibers (for example, known by the trade name "NBF

(SP)," Product of Yamato Boseki Co. Ltd.), TPC fibers (for example, known by the trade name "TPC" Product of Chisso Co. Ltd.), PR-P (for example, known by the trade name "PR," Product of Ube Nitto Kasei Co. Ltd.), etc., can be used effectively, as well.

[0012]

For the aforementioned polyethylene used as the sheath component in the fiber made of a core-sheath structure having the aforementioned polyethylene as the sheath component, those having a melting point in the range of 120-140°C are desirable. For the core component, polyethylene terephthalate (melting point 250-270°C), polypropylene (melting point 150-170°C), etc., can be mentioned. As for the ratio of the aforementioned sheath component and the core component, 30-70 parts by weight of the aforementioned sheath component and 70-30 parts by weight of the aforementioned core component is desirable, and in order to achieve high fusion strength, use of 50-70 parts by weight of the aforementioned sheath component and 50-30 parts by weight of the aforementioned core component is preferable. For the fiber having a core-sheath structure with the sheath component made of the aforementioned polyethylene, commercial products, for example, F6 fibers (for example, those known by the trade name "TJ04CE," Product of Teijin Co. Ltd.), ETC fibers (for example, those known by the trade name "ETC," Product of Chisso Polypro Co. Ltd.), SH fibers (for example, those known by the trade name "NBF (SH)," Product of Yamato Boseki Co. Ltd.], etc., can be used effectively, as well.

[0013]

For the aforementioned polyester with a low melting point used as the sheath component in the fibers made of a core-sheath structure having the aforementioned sheath component as the sheath component, known polyesters with a low melting point can be used effectively without any restriction, and in this case, it is desirable when the material is selected from those having a melting point in the range of 100-150°C. For the core component, polyethylene terephthalate (melting point 250-270°C), polypropylene (melting point 150-170°C), etc., can be mentioned. As for the ratio of the aforementioned sheath component and the core component, 40-90 parts by weight of the sheath component and 60-10 parts by weight of the core component are desirable, and it is further desirable when sheath component used is in the range of 50-90 parts by weight and the core component used is in the range of 50-10 parts by weight. For the fiber having a core-sheath structure with the sheath component made of the aforementioned polyester with a low melting point, commercial products, for example, ELK fibers (for example, known by the trade name "ELK"), TBF fibers (for example, known by the trade name "TBF") (both product of Teijin Co. Ltd.), Melty fibers (for example, known by the trade name "Melty 4080," product of Unitika Co. Ltd.) etc., can be used effectively, as well.

[0014]

The thickness (fiber size) of the fiber used for the aforementioned fiber A and for the aforementioned fiber B may be the same or different, and in specific terms, a fiber size in the range of 2-15 d (denier) is desirable and in the range of 3-6 d is further desirable. It is not desirable when the aforementioned thickness of the fiber is below 2 d since the space for the mechanical fastener is reduced when the nonwoven fabric obtained is used as a female component of a mechanical fastener, and furthermore, the adhesive strength (fusion strength) per intersection of the same kind of fibers is reduced, and the engagement force with the male component when used as the aforementioned female component is reduced. On the other hand, it is not desirable when the thickness of the fiber exceeds 15 d since the rigidity of the fiber is increased and hooking with the male component is reduced when used as the aforementioned female component despite an increased adhesive strength per intersection achieved. Furthermore, the length of each fiber may be the same or different, and in specific terms, a length in the range of 40-80 mm is desirable.

[0015]

Furthermore, the mixing ratio of the aforementioned fiber A and fiber B is determined according to the fibers used, and in this case, it is desirable when 30-70 parts by weight of fiber A is used for 100 parts by weight of the sum of the aforementioned fiber A and the aforementioned fiber B. It should be noted that the aforementioned mixing ratio is the same when the fiber C described below is used. In specific terms, when a fiber having a core-sheath structure in which the aforementioned polypropylene with a low melting point is used as the aforementioned fiber A and a fiber having a core-sheath structure in which a polyethylene is used as the aforementioned fiber B is used, it is desirable when the amount of the aforementioned fiber A included is in the range of 30-70 parts by weight for 100 parts by weight of the sum of the aforementioned fiber A and the aforementioned fiber B. In this case, it is not desirable when the mixing ratio of the aforementioned fiber A is either below 30 parts by weight or above 70 parts by weight since the freeness of the fiber is reduced and no difference is achieved from those of nonwoven fabrics made of a single fiber.

[0016]

Furthermore, a fiber having a low fusion with the aforementioned two kinds of fibers (hereinafter referred to as "fiber C"), that is, either with fiber A or fiber B, may be included in the nonwoven fabric of the present invention as well. For the aforementioned fiber C, fibers selected among the group of fibers consisting of a fiber having a core-sheath structure in which the sheath

component is made of the aforementioned polypropylene with a low melting point, a fiber having a core-sheath structure in which the sheath component is made of the aforementioned polyethylene and a fiber having a core-sheath structure in which the sheath component is made of the aforementioned polyester with a low melting point can be used effectively. In other words, when a fiber having a core-sheath structure in which the sheath component is made of the aforementioned polypropylene with a low melting point is used as the fiber A, and a fiber having a core-sheath structure in which the sheath component is made of the aforementioned polyethylene is used as the fiber B, it is desirable when a fiber having a core-sheath structure in which the sheath component is made of the aforementioned polyester with a low melting point is used as the fiber C. As explained above, when a three-component system (a system formed by mixing the aforementioned three kinds of fibers) is used, it is possible to further increase the freeness of the fiber achieved by a two-component system while an appropriate fiber density is retained.

[0017]

Furthermore, the thickness and the length of the aforementioned fiber C can be appropriately selected within the range described in the explanation of the aforementioned fibers A and B.

[0018]

Furthermore, as for the mixing ratio of the aforementioned fiber C when the aforementioned fiber C is used in combination, 20-40 parts by weight of fiber C for 100 parts by weight of the total weight of the aforementioned fibers A-C is suitable. Furthermore, in specific terms, when a fiber having a core-sheath structure in which the sheath component is made of the aforementioned polypropylene with a low melting point is used as the fiber A, a fiber having a core-sheath structure in which the sheath component is made of the aforementioned polyethylene is used as the fiber B, and a fiber having a core-sheath structure in which the sheath component is made of the aforementioned polyester with a low melting point is used, it is desirable when 20-40 parts by weight of fiber [C] for 100 parts by weight of the total weight of fibers is suitable.

[0019]

Furthermore, a desired fiber that is not likely to undergo fusion with any of the aforementioned three kinds of fibers can be added in the present invention as well.

[0020]

Furthermore, it is desirable when the basis of the nonwoven fabric of the present invention formed by mixing each of the aforementioned fibers is in the range of 20-50 g/m^2, and the fiber density is preferably in the range of 0.01-0.05 g/cm^3.

[0021]

Furthermore, fibers of the same kinds in each of the aforementioned fibers are firmly fused at each intersection in the nonwoven fabric of the present invention, and the aforementioned intersection is provided (uniformly exists) for the entire area (entire nonwoven fabric). The aforementioned point (the structure of the fibers of the nonwoven fabric used in the present invention) is explained further using Figures 1 and 2 as references. In this case, Figure 1 is a model drawing that shows a model structure of each fiber of an embodiment of the nonwoven fabric of the present invention and Figure 2 is a drawing that shows the condition where the engagement member of a male component of the mechanical fastener is applied onto the nonwoven fabric shown in Figure 1. In the explanation given below, two-component system composed of fiber A and fiber B is used and the same explanation can be given for a system containing three or more component fibers as well.

[0022]

The nonwoven fabric 1 of the present invention shown in Figure 1 is formed by mixing mutually slightly fusible fiber A and fiber B. Furthermore, in the aforementioned nonwoven fabric 1, the aforementioned fibers A are firmly fused at the intersections a with each fiber A, and furthermore, the aforementioned fibers B are firmly fused at the intersections b with each fiber B of fibers of the same kind (fiber A and fiber A or fiber B and fiber B). Furthermore, the aforementioned intersections are provided essentially uniformly over the entire area of the nonwoven fabric. In this case, the terminology "essentially uniformly" means the presence of intersections over the entire area of the nonwoven fabric. Furthermore, the number of the aforementioned intersections per basis (total number of the aforementioned intersections a and b) is preferably in the range of 2.5×10^6 - 1.0×10^8 intersections/m^2. Furthermore, the terminology "firmly fused" means fusion between thermally fusible components of the same kind and includes those having a fusion strength of the monofilament of at least 3 gf. It should be noted that the aforementioned fusion strength of the monofilament is measured according to the measurement method explained below.

[0023]

Measurement method of fusion strength of monofilament

First, two pieces of monofilament 42 and 42' are arranged on a pattern paper 41 provided with a square-shaped cut [the area indicated the alternating long-short dashed line in Figure 3(a) [sic]] at the center area of the same as shown in Figure 3(a) perpendicular to each other and in such a manner that the intersection of the fibers is positioned at the center area, and the aforementioned monofilaments 42 and 42' are fused onto the aforementioned pattern paper 41 with an adhesive. Subsequently, hot air with a process temperature of 143°C is applied onto the aforementioned pattern paper 41 fused with the aforementioned monofilaments 42 and 42' for 12 sec at a wind velocity of 2.3 m/sec and a heat treatment is provided. The aforementioned pattern paper 41 heat-treated and fused with the fibers is cut along the dotted lines shown in Figure 3(b) to give two square pieces 43 and 43' onto which the end pieces of each monofilament 42 and 42' are bonded as shown in Figure 3(c). Furthermore, each cut piece 43 and 43' is pulled in the direction shown by the arrow in Figure 3(c) at a rate of 50 mm/min, the strength of the aforementioned intersection is measured and the value obtained is used as the fusion strength of the monofilament.

[0024]

Furthermore, as shown in Figure 1, meshes A' and B' made of the same kinds of fiber, respectively, that is, the mesh of the same fiber A' surrounded by the aforementioned fiber A and the intersection a and the mesh of the same fiber B' surrounded by the aforementioned fiber B and the intersection b, are formed. In addition, many non-fused intersections c where dissimilar fibers, that is, fiber A and fiber B, are overlaid and cross without fusion of the individual fibers, and lightly fused intersections d where the individual fibers are weakly fused are also formed. In this case, the terminology "weakly fused" means fusion among dissimilar thermally fusible components and having a fusion strength of 2 gf or below.

[0025]

Furthermore, mesh C' formed by the aforementioned intersections a and b and the aforementioned non-fused intersection c and/or the aforementioned weakly fused intersection d is free to undergo deformation and expansion. In specific terms, the aforementioned mesh C' is structured by overlapping a part of the meshes formed by the same kind of fiber A' and the same kind of fiber B', that is, dissimilar fibers, and is formed by inclusion of the aforementioned intersections a and b and the aforementioned non-fused intersection c or the aforementioned weakly fused intersection d.

[0026]

In the nonwoven fabric of the present invention, the freeness of each fiber A and B is high since the aforementioned non-fused intersections c are included, and furthermore, the aforementioned weakly fused intersections d easily undergo dislocation when a slight stress is applied, and for example, when used as a female component of a mechanical fastener, a function that is the same as that of the aforementioned non-fused intersection c can be achieved, and as a result, a high degree of freeness can be provided for fibers A and B. Therefore, fiber meshes of the same kind A' and B' freely undergo deformation, and furthermore, in addition to deformation, the aforementioned mesh C' freely accommodate expansion as well. In other words, even when the fiber density of the nonwoven fabric is increased compared to those of standard nonwoven fabrics and the distance between fibers L is reduced to below those of standard nonwoven fabrics, deformation and expansion of the aforementioned mesh C' can be freely achieved since the degree of freeness of fibers A and B is high. In other words, the nonwoven fabric of the present invention is formed as explained above; therefore, even when the density of the fiber is the same or higher than those of standard nonwoven fabrics, the distance between fibers in the same kind of fiber (in this case, the aforementioned "distance between fibers" means the distance between fibers of the same kind (L' shown in Figure 1)) is greater than those of standard nonwoven fabrics. For example, the distance between fibers in the nonwoven fabric of the present invention, where the mixing ratio of fiber A and fiber B is 1:1, is approximately two times the distance between fibers of a standard nonwoven fabric made of a single fiber having the same fiber density.

[0027]

Therefore, when the nonwoven fabric of the present invention is used as the female component of a mechanical fastener, sufficient space between fibers exists and each of the aforementioned fiber mesh of the same kind A' and B' freely undergo deformation, and furthermore, the aforementioned mesh C' easily undergoes deformation and expansion; thus, the engagement member of the male component can smoothly fit into the space formed between fibers A-A, B-B and A-B, in other words, into the aforementioned fiber meshes of the same kind A' and B' and the space of the aforementioned mesh C' as shown in Figure 2, and engagement between the fibers A and B is made possible. In particular, the degree of freeness of the aforementioned mesh C' is high and deformation and expansion can be easily achieved, and furthermore, the aforementioned engagement member 10 can be easily fitted into the space inside the aforementioned mesh C', and as a result, engagement can be easily achieved with each fiber. In addition, as shown in Figure 2, in comparison to a nonwoven fabric made of a single fiber, the degree of freeness of each structural fiber is high; thus, an entanglement of plurality of

fibers with a single engagement member 10 can be made possible and in comparison to nonwoven fabrics made of a single fiber, the peel strength can be further increased, and furthermore, the degree of scuffing at the time of peeling of the male component can be reduced as well.

[0028]

Furthermore, when a fiber having a high fusion strength (for example, a fiber content of the higher mixing ratio of the sheath component, etc.) is used as the aforementioned fiber A or fiber B, the peel strength at the time of bonding of the male component can be further increased. In this case, the distance L between the aforementioned fibers varies depending on the type and number, mixing ratio and the fiber density of the fiber used, and in the case of the nonwoven fabric of the present invention, the aforementioned distance in the range of 50-800 μm is desirable.

[0029]

Furthermore, it is desirable when the tensile strength of the nonwoven fabric of the present invention in the MD direction (the machine direction at the time of production) is at least 1000 g wt/50 mm and the CD direction (the direction perpendicular to the MD direction) is at least 200 g wt/50 mm. In this case, the aforementioned tensile strength is measured according to the measurement method explained below.

Tensile strength: As a measuring machine, "Tensilon RTA-100" of Orientec Co. (Ltd.) was used and a nonwoven fabric cut to form a dimension of 200 x 50 mm was prepared as a sample. Subsequently, the aforementioned sample was pulled under a condition of the chuck distance of 75 mm and the strain rate of 300 mm/min and the stress at the time of rupturing of the sample was measured and used as the tensile strength. In this case, the aforementioned measurement was done 10 times each in the MD direction and in the CD direction and the mean value obtained was used as the measured value.

[0030]

The nonwoven fabric of the present invention can be produced according to the method explained below. That is, when the nonwoven fabric used is a two-component type made of the aforementioned fiber A and fiber B, production can be easily achieved using an air-through system in which mixing is carried out for the aforementioned each fiber as usual to form a fiber web, then, blowing hot air of 130-150°C onto the aforementioned fiber web for the duration of 5-10 (sec) at a wind velocity of 1-2 m/s. Furthermore, when the nonwoven fabric is made of three or more kinds of fibers, production can be easily achieved using the aforementioned

air-through system for the two-component system after forming a web made of three kinds of fibers of A, B and C. In addition, production of the nonwoven fabric of the present invention can be easily achieved according to a standard method used for production of nonwoven fabrics such as embossing, as well.

[0031]

The nonwoven fabric of the present invention is structured as explained in detail above and can be used effectively as the female component of mechanical fasteners as well as a component or surface material for floor wipes, sanitary napkins, disposable diapers, etc. It should be noted that the male component of the aforementioned mechanical fastener is a sheet provided with many protruding engagement members shaped like hooks, mushrooms, etc., and commercial products such as "Magic Tape" (registered trademark of Kuraray Co. Ltd.), "Quickron" (registered trademark of YKK Co. Ltd.), etc., can be used without any limitations. Furthermore, the aforementioned female component is a sheet, etc., capable of forming an engagement with the aforementioned male component.

[0032]

Application examples

The present invention is further explained in specific terms with the application examples below, but the present invention is not limited by these examples.

[0033]

Application Example 1

The fiber A and fiber B shown below were used each in an amount also shown below, and production of a nonwoven fabric was carried out according to the manufacturing method explained below so as to produce a nonwoven fabric of the present invention.

Fiber A: A fiber having a core-sheath structure in which a polyethylene terephthalate (PET) is used as the core component and a polyethylene (PE) is used as the sheath component and having the weight ratio of the core component and the sheath component: core component/sheath component = 40/60, the fiber size of 4 d x 51 mm and the mixing ratio of fiber A = 50 parts by weight

Fiber B: A fiber having a core-sheath structure in which a PET is used as the core component and a polypropylene (PP) is used as the sheath component and having the weight ratio of the core component and the sheath component: core component/sheath component = 50/50, the fiber size of 4 d x 51 mm and the mixing ratio of fiber B = 50 parts by weight

Method of production: First, a card web is formed by mixing the fiber A and fiber B at the aforementioned mixing ratio, and the card web obtained is treated with hot air of 142°C for 6 sec at a wind velocity of 1-2 m/sec so as to produce a nonwoven fabric having a basis [weight] of 27 g/m^2.

[0034]

Furthermore, for the nonwoven fabric obtained, each test described below was carried out and an evaluation was carried out. As a result, the tackiness of 83 gf and the peel strength of 160 gf were achieved, and the shearing force was 2160 gf, and furthermore, the degree of scuffing was grade 2.

[0035]

Tackiness

As shown in Figure 4, a male component 20 (30 x 40 mm) (see Figure 5 for reference) (trade name "CS-200 900 PPI," Product of 3M Co.) was firmly applied to the aforementioned nonwoven fabric obtained and the mount 22 provided with the aforementioned male component 20 was pulled toward the vertical direction (direction shown by the arrow) at a rate of 300 mm/min and the tensile strength at the time when the aforementioned male component 20 was peeled from the nonwoven fabric 1 was defined as the tackiness. In this case, the male component 20 was arranged on the nonwoven fabric 1 and a dead load of 16.7 gf/cm^2 was applied for 10 sec in order to achieve firm bonding. It should be noted that the aforementioned male component 20 is fastened onto one surface of the aforementioned mount 22 with a double-sided tape 23 as shown in Figure 5, and an acrylic sheet 21 is fastened onto the other surface of the aforementioned mount 22 at the position corresponding to the aforementioned male component 20 with a double-sided tape 23 in order to maintain the peeling angle at 0 degrees. Furthermore, as shown in Figure 6, the aforementioned nonwoven fabric 1 is fastened onto the acrylic sheet 3 with a double-sided tape 2 and used.

[0036]

Peel strength

First, the nonwoven fabric 1 was cut to form a size of 5 cm x 5 cm and the aforementioned nonwoven fabric 1 was applied onto the outer layer nonwoven fabric (back sheet) of a Merries Pants (trade name, disposable diaper by Kao Co. (Ltd.)) with a double-sided tape. Furthermore, a male component with a size of 3 cm x 2 cm was prepared and the back surface of the aforementioned male component was applied onto a mount with a size of 3 cm x 3 cm, and furthermore, a base material film having the same size as that of the aforementioned

male component was applied onto the aforementioned mount so as to form a male component sample 20', in which the area made of the mount with a width of 10 mm alone was formed on one end member side. Furthermore, as shown in Figure 7, the male component sample 20' was placed on the aforementioned nonwoven fabric 1, leaving 10 mm of the aforementioned one end member 20a (area made of the mount alone); then, a 1-kg roller was applied onto the aforementioned male component sample 20' in a single reciprocating motion so as to firmly bond the aforementioned male component sample 20' onto the aforementioned nonwoven fabric 1. Subsequently, grabbing the aforementioned one end member 20a, the aforementioned male component sample 20' was pulled toward the direction shown by the arrow (same direction as the longitudinal direction of the male component sample 20') at a rate of 300 mm/min, and the force required for peeling of the aforementioned male component sample 20' from the nonwoven fabric 1 was measured. The aforementioned process was repeated 10 times and the mean value obtained was used as the peel strength. In this case, a peel test mode data processing software by Orientec Co. (Ltd.) [trade name "MP-100P" (MS-DOS) Ver. 43.1] was used for processing of the measured data. Furthermore, an evaluation of the peel strength was carried out based on the "Value of the 5-point mean load" in the data. In this case, the aforementioned mount and the base material film are not especially limited as long as the material accommodates fastening of the aforementioned male component.

[0037]

Scuffing

The surface of the nonwoven fabric 1 after measuring of the peel test was visually examined and the degree of scuffing was evaluated according to the 5 grades explained below.

Grade 1: Absence of scuffing

Grade 2: Slight degree of scuffing

Grade 3: Considerable degree of scuffing

Grade 4: Significant degree of scuffing

Grade 5: Rupturing of nonwoven fabric

[0038]

Shear force

First, the nonwoven fabric 1 was cut to form a size of 5 cm x 5 cm and the aforementioned nonwoven fabric 1 was applied onto an acrylic sheet with a double-sided tape. Furthermore, a male component 20 with a size of 3 cm x 2 cm was prepared and the back side of the aforementioned male component 20 was applied onto one end side of the mount 31 with a size of 3 cm x 12 cm as shown in Figure 8, and furthermore, a base material film 32 with a size

of 3 cm x 7 cm was applied onto the aforementioned mount 31 at the side corresponding to the aforementioned male component 20 so as to form a sample tape 30 provided with 50 mm of the area made of the mount 31 alone at the end member 30a of one side. Furthermore, as shown in Figure 8, the sample tape 30 [sic] provided with the male component 20 was placed onto the aforementioned nonwoven fabric 1 in such a manner that the area provided with the male component 20 came in contact with the nonwoven fabric 1; then, a 1-kg roller was applied onto the aforementioned sample tape 30 in a single reciprocating motion so as to firmly bond the aforementioned sample tape 30 onto the aforementioned nonwoven fabric 1. Subsequently, grabbing the aforementioned one end member 30a [sic], the aforementioned sample tape 30 was pulled toward the direction shown by the arrow (direction same as the longitudinal direction of the acrylic sheet and the sample tape 20 [sic]) at a rate of 300 mm/min, and the force required for peeling of the aforementioned sample tape 20 from the nonwoven fabric 1 was measured. The aforementioned process was repeated 10 times to obtain the measured data. In this case, a peel test mode data processing software by Orientec Co. (Ltd.) [trade name "MP-100P" (MS-DOS) Ver. 43.1] was used for processing of the measured data and furthermore, an evaluation of the shear strength was carried out based on the "Maximum point load" in the data. In this case, the aforementioned mount and the base material film are not especially limited as long as the material accommodates fastening of the aforementioned male component.

[0039]

Application Example 2

The fiber A, fiber B and Fiber C shown below were used each in an amount also shown below and production of a nonwoven fabric of the present invention was carried out according to the manufacturing method explained below so as to produce a nonwoven fabric of the present invention.

Fiber A: A fiber having a core-sheath structure in which a PET is used as the core component and a PE is used as the sheath component and having the weight ratio of the core component and the sheath component: core component/sheath component = 40/60, the fiber size of 3 d x 51 mm and the mixing ratio of fiber A = 35 parts by weight

Fiber B: A fiber having a core-sheath structure in which a PET is used as the core component and a PP is used as the sheath component and having the weight ratio of the core component and the sheath component: core component/sheath component = 50/50, the fiber size of 3 d x 51 mm and the mixing ratio of fiber A [sic] = 50 parts by weight

Fiber C: A fiber having a core-sheath structure in which a PET is used as the core component and a PET is used as the sheath component and having the weight ratio of the core

component and the sheath component: core component/sheath component = 50/50, the fiber size of 3 d x 51 mm and the mixing ratio of fiber A [sic] = 30 parts by weight

Method of production: Production was carried out according to the method described in Application Example 1 so as to produce a nonwoven fabric having a basis of 30 g/m^2.

[0040]

Furthermore, each test described in Application Example 1 was carried out for the aforementioned nonwoven fabric obtained and an evaluation was carried out in the same manner. As a result, the tackiness and peel strength of 102 gf and 153 gf, respectively, were achieved. Furthermore, the shear force was 2200 gf and the degree of scuffing was grade 3.

[0041]

Comparative Example 1

The fiber A shown below alone was used and production of a nonwoven fabric was carried out according to the method described in Application Example 1.

Fiber A: A fiber having a core-sheath structure in which a PET is used as the core component and a PE is used as the sheath component and having the weight ratio of the core component and the sheath component: core component/sheath component = 40/60, the fiber size of 4 d x 51 mm.

[0042]

Furthermore, each test described in Application Example 1 was carried out for the aforementioned nonwoven fabric obtained and an evaluation was carried out in the same manner. As a result, the tackiness and peel strength of 36 gf and 102 gf, respectively, were achieved. Furthermore, the degree of scuffing was grade 1 and the shear force was 1850 gf.

[0043]

Comparative Example 2

The fiber A and fiber B shown below were used and production of a nonwoven fabric was carried out according to the method described in Application Example 1.

1 Fiber A: A fiber having a core-sheath structure in which a PET is used as the core component and a PE is used as the sheath component and having the weight ratio of the core component and the sheath component: core component/sheath component = 40/60, the fiber size of 4 d x 51 mm, the mixing ratio of fiber A = 20 parts by weight

Fiber B: A fiber having a core-sheath structure in which a PET is used as the core component and a PP is used as the sheath component and having the weight ratio of the core

component and the sheath component: core component/sheath component = 50/50, the fiber size of 4 d x 51 mm and the mixing ratio of fiber A = 80 parts by weight

[0044]

Furthermore, each test described in Application Example 1 was carried out for the aforementioned nonwoven fabric obtained and an evaluation was carried out in the same manner. As a result, the tackiness and peel strength of 64 gf and 97 gf, respectively, were achieved. Furthermore, the degree of scuffing was grade 3 and the shear force was 1980 gf.

[0045]

Comparative Example 3

The fiber A shown below alone was used and production of a nonwoven fabric was carried out according to the method described in Application Example 1.

Fiber A: A fiber having a core-sheath structure in which a PET is used as the core component and a PE is used as the sheath component and having the weight ratio of the core component and the sheath component: core component/sheath component = 50/50, the fiber size of 4 d x 51 mm.

[0046]

Furthermore, each test described in Application Example 1 was carried out for the aforementioned nonwoven fabric obtained and an evaluation was carried out in the same manner. As a result, the tackiness and peel strength of 32 gf and 62 gf, respectively, were achieved. Furthermore, the degree of scuffing was grade 2 and the shear force was 1490 gf.

[0047]

Table 1

			タック力 (1)		剥離力 (2)		剪断力 (3)		(4) 毛羽立ち
				gf		gf		gf	
(5)	実施例	1	○	83	○	160	○	2160	2
		2	◎	102	○	153	○	2200	3
(6)	比較例	1	×	36	△	102	△	1850	1
		2	△	64	△	97	○	1980	3
		3	×	32	×	62	×	1490	2

Key: 1 Tackiness
2 Peel strength
3 Shear force
4 Degree of scuffing
5 Application examples
6 Comparative examples

[0048]

Effect of the invention

As explained in detail above, the nonwoven fabric of the present invention has an excellent feel to the touch and an excellent peel strength when the male component of the mechanical fastener is applied while suppressing formation of scuffing, and furthermore, it accommodates repeated application of the aforementioned male component and is useful as a material to be used as a female component of a mechanical fastener.

Brief description of the figures

Figure 1 is a model drawing that shows a model structure of each fiber of an embodiment of the nonwoven fabric of the present invention.

Figure 2 is a drawing that shows the condition where the engagement member of a male component of the mechanical fastener is applied onto the nonwoven fabric shown in Figure 1.

Figures 3(a)-(c) are schematic views that show a measuring method of the fusion strength of single yarn.

Figure 4 is a schematic view that shows the measuring method of the tackiness.

Figure 5 is a schematic view that shows the attachment method of the male component of a mechanical fastener at the time of measuring of the tackiness.

Figure 6 is a schematic view that shows the attachment method of the nonwoven fabric at the time of measuring of the tackiness.

Figure 7 is a schematic view that shows the measuring method of the peel strength.

Figure 8 is a schematic view that shows the measuring method of the shear force.

Figure 9 is a partially enlarged view of a sheet used for the female component in the prior art.

Figure 10 is a partially enlarged view of a nonwoven fabric used in the prior art.

Figure 11 is a partially enlarged view of a nonwoven fabric used in the prior art.

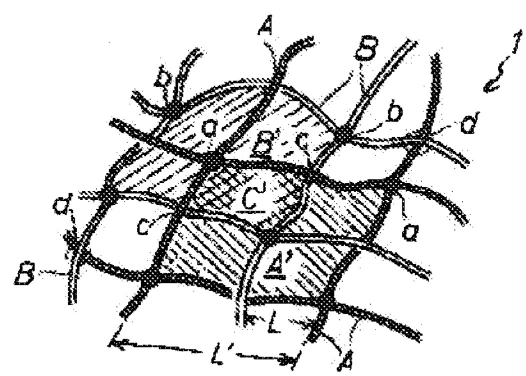


Figure 1

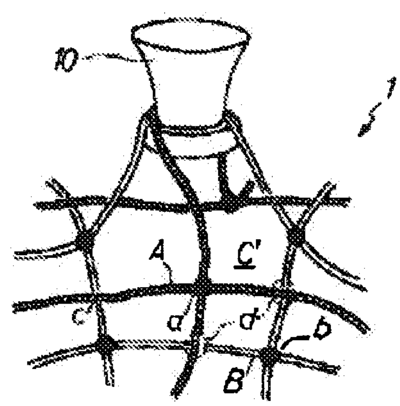


Figure 2

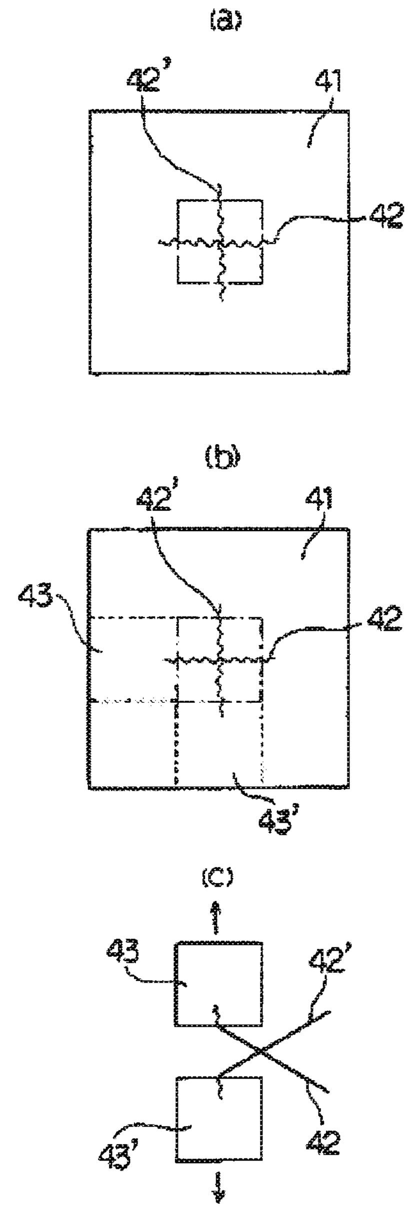


Figure 3

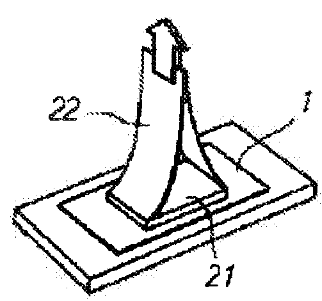


Figure 4

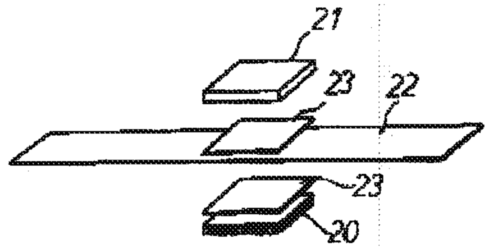


Figure 5

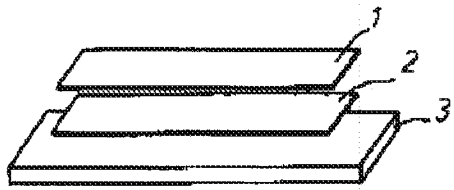


Figure 6

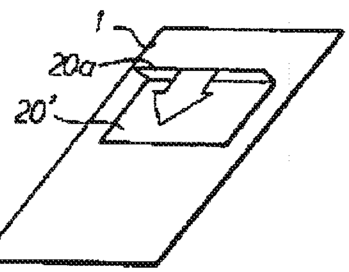


Figure 7

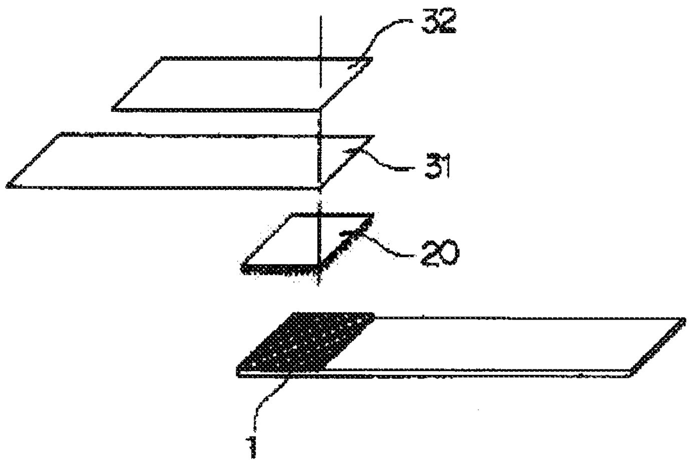


Figure 8

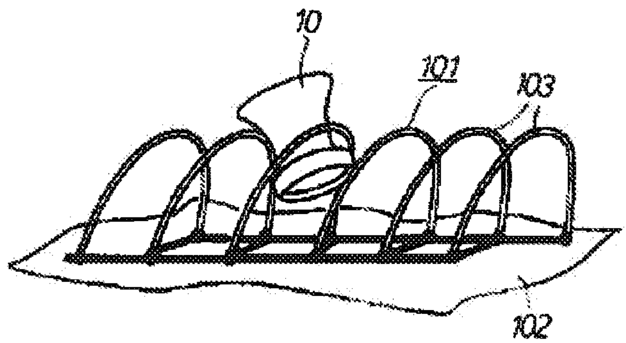


Figure 9

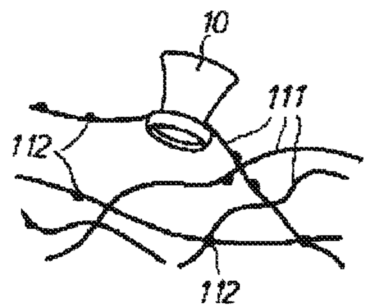


Figure 10

Figure 11